DISCUSSION AND CORRESPONDENCE

ATMOSPHERIC POLLUTION[1]

THE Advisory Committee on Atmospheric Pollution has published its fourth report summing up the observations in the year 1917–1918.

The full lists showing in detail the monthly deposit figures at various stations are not reproduced, inasmuch as these have been already published in the *Lancet;* but full returns from two stations, Newcastle and Malvern, are given; and these give the highest and lowest deposits.

Figures of total solids deposited monthly are given for all stations, 24 in number, the months being on a thirty-day basis.

In many instances the rainfall as measured at these stations did not agree with the amount obtained by the official Meteorological Office gauges but this is easily explained when it is remembered that the gauges of the committee are often on roofs and are thus elevated. The rainfall is given in millimeters, and it would be well if we in the United States would follow this example.

At a given London station the data for the half year, October to March, 1917–1918, were:

Rainfall 43 mm.; tar 0.14 metric ton per square kilometer; carbonaceous matter other than tar 2.18 tons; insoluble ash 3.50; soluble ash 4.15; or total solids 11.41 tons. Of the soluble matter there were 1.46 tons of sulphate, 0.63 tons of chlorine, and 0.05 of ammonia.

No relationship can be discovered between the deposit of insoluble matter and the amount of rainfall. With the soluble matter, however, it is different, and in general it may be said to vary directly as the rainfall. The relation may be roughly expressed by the formula, $S = 0.058\ R + 2.5$, where R is the rainfall in mm. and S the deposit of soluble matter in tons per square kilometer. It is not suggested that this expression can be used to find the soluble deposit when the rainfall is known but gives only the general nature of the relationship.

[1] Meteorological Office. Report on Observations 1917–18. Advisory Committee on Atmospheric Pollution, London, 1919.

The report also contains the results of analysis of the rainfall at Georgetown, British Guiana, the nearest land in the direction of the prevailing east-northeast trade winds being the shore of Morocco, distant 3,000 nautical miles. There can be little doubt that the solids contained in the rain waters collected are those normal to the rains of the trade winds, with perhaps some derived from the coastal sea-spray.

The average results over the two years 1916 and 1917 were as follows:

	Solids in Solution, mg./litre
Ca	7.95
Mg	3.44
K	2.77
Na	16.36
Al_2O_3	0.58
Fe_2O_3	1.97
SiO_2	0.20
Cl_2	33.93
SO_4	12.02
CO_3	9.78
NO_3	11.57
NH_4	0.12
	100.69

It is shown that 55 per cent. of the solids in solution in the rainfall are cyclic sea salts, while 45 per cent. must have been derived from atmospheric sources.

The report also contains an account of certain experiments made to determine the best method of measuring continuously the suspended impurity in the air. A. M.

CAROTINOIDS AS FAT-SOLUBLE VITAMINE

MY attention has been called to Steenbock's interesting observation, in SCIENCE of October 10, that yellow corn and the colored roots, such as carrots and sweet potatoes, are richer in fat-soluble vitamine than white corn and the pigmentless roots and tubers. A number of other instances are noted in which fat-soluble vitamine and carotinoid pigment occur simultaneously. The fact that these relations have led Steenbock to the provisional assumption that the fat-soluble vitamine is one of the carotinoid pigments has prompted me to call attention to a number of cases where this relation apparently breaks down.

Drummond[1] has recently tested the possibility of carotin being the fat-soluble vitamine by feeding both crude and crystalline preparations of the pigment to rats, although the question may be raised as to the logic of testing the relation to fat-soluble vitamine of a substance of which is not natural to the body of the animal upon which the test is performed. Carotin is not found in the body of the rat.

The writer[2] has recently reported the fact that it is possible to raise a flock of chickens from hatching to maturity on a diet free, or at most containing the merest traces, of carotinoids. Not only did the mature hens lay eggs whose yolks were free from carotinoids, but a second generation of carotinoid-free chicks were hatched from them. Only one of two possible conclusions can be drawn from this experiment. Either the fat-soluble vitamine and the yellow plant pigments are not related physiologically or the fat-soluble vitamine requirement of fowls differs from that of mammals. The diet which we used for the successful growth of the chickens contained an abundance of fat-soluble vitamine, however, in the form of carotinoid-free pork liver.

Another interesting case of negative relation between carotinoids and fat-soluble vitamine is seen in the fact that a number of species of animals, such as sheep, swine, dogs, cats, rats, rabbits, and guinea pigs are free from carotinoids in blood[3] and adipose tissues, and nerve cells.[4] The milk fat of the mammals of these species is also colorless. How is one to make the successful raising of young on carotinoid-free milk coincide with the assumption that fat-soluble vitamine is one of the yellow plant pigments?

Still another instance of negative relation between carotinoids and fat-soluble vitamine is seen in the case of certain vegetable oils, like cottonseed oil. Fresh cottonseed oil, after being purified from resinous material, has a beautiful golden yellow color and is rich[5] in carotinoids. It should also contain an abundance of fat-soluble vitamine to be in keeping with Steenbock's assumption. Apparently this is not the case since both bleached and unbleached cottonseed oil has been found to be free from vitamine.[6] The oil from yellow corn, similarly, should contain the vitamine, but the same investigation[6] has reported failure to obtain growth with diets containing the commercial unbleached corn oil.

It is thus possible to cite a number of instances where the probable relation between carotinoids and fat-soluble vitamine breaks down. No doubt others could be found. The writer regards the instances of a simultaneous occurrence of fat-soluble vitamine and plant carotinoids as fortuitous. The similarity of certain of the properties of the two kinds of material admittedly offers a working basis for the ultimate isolation of the fat-soluble vitamine, and research in this direction offers many fascinating possibilities. The relation between the vitamine and color in the case of corn may be a genetic one, in which case it should be possible to transfer the vitamine to white corn. Further attempts, however, to establish an identity of the vitamine with one of the carotinoid pigments is not likely to lead to profitable results.

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[1] J. C. Drummond, *Biochem. Jour.*, XIII., 81, 1919.

[2] L. S. Palmer and H. L. Kempster, *Jour. Biol. Chem.*, XXXIX., 299, 1919.

[3] L. S. Palmer, *Jour. Biol. Chem.*, XXVII., 27, 1916.

[4] D. H. Dolley and Frances Guthrie, Science, N. S., L., 190, 1919.

[5] L. S. Palmer and C. H. Eckles, Missouri Agr. Exp. Sta. Res. Bull. 10, 361, 1914.

[6] E. V. McCollum, N. Simmonds and W. Petz, *Am. Jour. Physiol.*, 41, 361, 1916.

SCIENTIFIC ARTICLES

WOUND HEALING IN EXPERIMENTAL (CELLFIBRIN) TISSUE[1]

1. If we make a defect in the skin, processes of healing set in which in time lead to a closure of the wound. Primarily, the defect

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